

Claims

- [c1] A device for electromanipulation of chemical species in vivo relative to a target tissue comprising:
an array base adapted to be placed coincident to the target tissue;
a plurality of electrode elements secured in spaced relation on the array base, the electrode elements adapted to be coupled to an electrical source.
- [c2] The device of claim 1 wherein the array base is formed of a nonconductive substrate.
- [c3] The device of claim 2 wherein the plurality of electrode elements are integral to the base.
- [c4] The device of claim 2 wherein the plurality of electrode elements project from the array base towards the target tissue.
- [c5] The device of claim 1 wherein the electrode elements that are independently addressable.
- [c6] The device of claim 1 wherein the electrode elements are addressable as one or more sets.

- [c7] The device of claim 1 wherein the array base is substantially conformable to facilitate contact between the electrodes and the target tissue.
- [c8] The device of claim 1 wherein the array base is substantially rigid with a geometric shape adapted to facilitate contact between the electrodes and a corresponding target tissue.
- [c9] The device of claim 1 wherein the electrode elements are spaced together in sufficient proximity to insure that a peak power of less than 1 kilowatt is needed for electro-manipulation of the target tissue.
- [c10] The device of claim 1 further comprising one or more fluid reservoirs adapted to deliver chemical species to the target tissue.
- [c11] The device of claim 1 wherein the electrical source is integrated within the array base.
- [c12] The device of claim 11 wherein the device is adapted for implantation into a patient.
- [c13] The device of claim 12 further comprising one or more fluid reservoirs adapted to deliver chemical species to the target tissue.
- [c14] The device of claim 13 wherein the chemical species are

released from the one or more fluid reservoirs responsive to a predetermined schedule.

[c15] The device of claim 13 wherein the chemical species are released from the one or more fluid reservoirs responsive to a predetermined time.

[c16] The device of claim 13 wherein the chemical species are released from the one or more fluid reservoirs responsive to a predetermined metabolic condition.

[c17] The device of claim 1 further comprising at least one micro plunger adapted to deliver chemical species to the target tissue.

[c18] The device of claim 17 further comprising:
at least one porous electrode element capping the at least one micro plunger whereby chemical species held with the at least one micro plunger are released through the at least one porous electrode element to the target tissue.

[c19] The device of claim 1 further comprising:
at least one external reservoir adapted to hold chemical species; and
at least one conduit fluidly coupling the at least one reservoir to the array base whereby the chemical species are delivered through the at least one conduit to the ar-

ray base for delivery to the target tissue.

[c20] The device of claim 1 further comprising a thin film of chemical species on the array base whereby the chemical species are delivered to the target tissue when the array base is coincident to the target tissue.

[c21] The device of claim 20 wherein the chemical species are retained within the thin film by absorption means.

[c22] The device of claim 21 wherein the chemical species are released from the thin film by application of an energy means.

[c23] A device for manipulation of chemical species in vivo relative to a target tissue comprising:
a nonconductive, conformable array base adapted to be place coincident to the target tissue;
a plurality of electrode elements projecting from the array base towards the target tissue, the electrode elements addressable individually, the plurality of electrodes adapted to be coupled to an electrical source;
a control means interposed between the electrical source and the plurality of electrode elements and in circuit communication therein, the control means adapted to establish an electrical potential between at least two electrodes; and

a delivery means adapted to introduce chemical species to the target tissue.

- [c24] A method for electromanipulation of chemical species in vivo relative to a target tissue comprising the steps of:
placing at least one array base coincident to a target tissue, the at least one array base containing a plurality of electrode elements;
establishing an electrical potential between at least two electrode elements in the plurality of electrode elements;
providing a chemical species coincident to the target tissue;
controlling the electrical potential whereby the chemical species are delivered to the target tissue.
- [c25] The method of claim 24 wherein the electrical potential effects electromigration of the chemical species to the target tissue.
- [c26] The method of claim 24 wherein the electrical potential effects electroporation of the target tissue.
- [c27] The method of claim 24 wherein the electrical potential effects both electroporation of the target tissue and electromigration of the chemical species to the target tissue in substantially concurrent synchronization.
- [c28] The method of claim 24, further comprising the steps of:

establishing a predetermined sequence of electrical potentials for the plurality of electrode elements; and
executing the predetermined sequence.

- [c29] A method for combining at least two distinct chemical species in vivo relative to a target tissue comprising the steps of:
- placing at least one array base coincident to a target tissue, the at least one array base containing a plurality of electrode elements;
 - establishing a first chemical staging location;
 - establishing a second chemical staging location;
 - establishing a chemical reaction location;
 - introducing a first chemical species to the first chemical staging location;
 - introducing a second chemical species to the second chemical staging location;
 - establishing an electrical potential between at least two electrode elements in the plurality of electrode elements;
 - and
 - controlling the electrical potential to migrate the first and second chemical species towards the chemical reaction location.
- [c30] The method of claim 29, wherein the electrical potential effects an oxidation reaction on the first chemical species.

- [c31] The method of claim 29, wherein the electrical potential effects an oxidation reaction on the second chemical species.
- [c32] The method of claim 29, wherein the electrical potential effects an oxidation reaction on a combination of the first and second chemical species.
- [c33] The method of claim 29 further comprising the step of electromigrating a combination of the first and second chemical species from the chemical reaction location to the target tissue.